REMARKS

Upon entry of this amendment, claims 23-42 and 44-45 will be pending.

Claim 23 has been amended to clarify that the board material treated by the method of the invention is a *composite* board material. The definition of "composite" is "made up of distinct parts." Paragraph 0002 describes certain board materials as having bonded-together elements. And being bonded-together elements, such materials obviously have the inherent property of being "made up of distinct parts." Paragraph 0013 describes examples of board materials such as wood chip board and oriented strand board, which obviously have the inherent property of being "made up of distinct parts." As emphasized in MPEP 2163.07(a), an application may be amended to refer to an inherent property, provided "it is clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill." Here one of ordinary skill and even one of no particular skill would immediately understand that board materials having bonded-together elements and materials such as wood chip board and oriented strand board have the property of being "made up of distinct parts," i.e., "composite."

I. Rejections Under 35 U.S.C. §103

A. Mickanickl et al. and Akhtar et al.

Applicant respectfully requests reconsideration of the rejection of claims 23, 24, 27-39, 41, 42 and 43 as being unpatentable under 35 U.S.C. §103(a) over U.S. Patent 5,804,035 (Michanickl et al.) in view of WIPO publication WO 03/040462 (Akhtar et al.).

Applicant's claim 23 requires swelling a composite board material by subjecting it to electromagnetic radiation and soaking / immersion in a liquid medium, and recovering a lignocellulosic element.

Mickanickl et al. disclose methods for the recovery of wood fibers from timber-derived materials by swelling the materials with an impregnating solution, heating the impregnated materials, and then separating the disintegrated

materials. Nowhere do Mickanickl et al. disclose utilizing electromagnetic radiation. The Office has cited Akhtar et al. to compensate for this deficiency.

Applicant respectfully submits that it would not have been obvious to one skilled in the art at the time of applicant's invention to pre-treat the board material of Michanickl et al. with the microwave radiation of Akhtar et al. for at least the following reasons:

a) The Akhtar et al. reference is non-analogous art;

b) Even if the Akhtar et al. reference were not non-analogous art, Akhtar et al.'s starting material is so different from Michanickl et al.'s and applicant's starting material that one skilled in the art would have no reason to apply Akhtar et al.'s teachings; and

c) Even if there Akhtar et al. reference were not non-analogous art, the function, purpose, and mechanism of Akhtar et al.'s microwave operation are such that one skilled in the art would have no reason to apply Akhtar et al.'s teachings.

i) Akhtar et al. Is Non-Analogous Art

According to MPEP §2141.01(a) and the Federal Circuit:

> In order to rely on a reference as a basis for rejection of an applicant's invention, the reference must either be in the field of applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the inventor was concerned. *In re Oetiker*, 977 F.2d 1443, 1446, 24 USPQ2d 1443, 1445 (Fed. Cir. 1992).

The Akhtar et al. process is, as its title underscores, for MICROWAVE PRE-TREATMENT *OF LOGS* FOR USE IN MAKING *PAPER AND OTHER WOOD PRODUCTS*. In contrast, the applicant's invention is directed to recycling "board materials," which are well known in the art as composite materials made up of particles, chips or the like in a matrix of man-made adhesive. These differences are substantial, in that the Akhtar et al. process seeks to reduce lignocellulosic fibers into their distinct elements of lignin and cellulosic fibers so that then the cellulosic fibers (wood fibers) can be used in making paper and have a low level of contamination by lignin (emphasis added):

> [0002] In the manufacture of paper from wood, the wood is first reduced to an intermediate stage in which *the wood fibers are separated from their natural environment* and transformed into a viscous liquid suspension known as a pulp. There are several classes of techniques which are known, and in general commercial use, for the production of pulp from various types of wood.... *In all of these processes for creating pulps from wood, the concept is to separate the wood fibers to a desired level of freeness from the complex matrix in which they are embedded in the native wood.*
>
> [0003] Of the constituents of wood as it exists in its native state, cellulose polymers are the predominate molecule. Cellulose is desired for retention in the pulp for paper production. The second most abundant polymer in the native wood is lignin. Lignin, the least desirable component in the pulp, is a complex macromolecule of aromatic units with several different types of interunit linkages. In the native wood, lignin physically protects cellulose polysaccharides in complexes known as lignocellulosics that must be disrupted for there to be accessibility to the polysaccharides, (e.g., by enzymes) or *to separate lignin from the matrix of the wood fibers.*

In sharp contrast, applicant's field is recycling board material by recovering lignocellulosic elements from discarded composite board material, so that these intact lignocellulosic elements can be recycled to make new products, as underscored in applicant's specification (emphasis added):

> [0001] The present invention relates to the recycling of lignocellulose based board (or panel) material comprised of a matrix of adhesively bonded lignocellulosic elements so as to permit *recovery of constituents of the board material, particularly but not exclusively of the lignocellulose.*
>
> [0002] It is well-known that various board materials comprise a matrix of lignocellulosic elements (e.g. in the form of chips, particles or fibres) bonded together by means of an adhesive such as, for example, a polyurethane, urea/formaldehyde, melamine-urea or phenolic resin. Examples of board materials produced in this way include MDF (Medium Density Fibreboard), particle board and chip board.
>
> [0003] Board materials of the type described above are used extensively for producing finished articles such as, for example,

> furniture. For this purpose, the board materials are entirely satisfactory. However there is a substantial amount of waste material for which disposal poses a problem. To illustrate the point, the UK furniture manufacturing industry generates over 170,000 tonnes of MDF waste every year. This does not include rejected and damaged furniture items. *Ideally the waste material would be recycled to recover constituents thereof, particularly the lignocellulose for reuse*. However, no satisfactory recycling process is currently available. The problem is made worse by the fact that the waste board material may be laminated to a surface layer such as, for example, paper foil or plastics (e.g. for decorative purposes) or may have, for example, plastic or metal inserts. As such, any recycling process will need to remove the laminates and/or inserts. In the absence of any suitable recycling process, most of the waste board material will be dumped in landfill site, which is becoming more difficult and very expensive.

Akhtar et al.'s field of taking natural wood and recovering wood fiber from it for use in paper making is not the same field as recycling discarded furniture and other board material. The starting materials are different, the end products are different, and the uses of the end products are different.

Since Akhtar et al.'s and applicant's fields are not the same, Akhtar et al. is only analogous art if it "is reasonably pertinent to the particular problem with which the inventor was concerned." Akhtar et al.'s recovering wood fiber from natural wood is in fact *not* reasonably pertinent to applicant's problem of how to recycle discarded furniture and other board material. Applicant's "problem" -- so to speak -- is how to break up board material comprising, a) lignocellulosic elements such as wood chips and the like, glued together by, b) man-made adhesive, in order to recover the a) lignocellulosic elements. Like any such "problem," the solution is dictated by what material you start with and what material you want to end up with. Here, Akhtar et al.'s starting material *and* their end product are fundamentally different from applicant's starting material and end product; so Akhtar et al.'s process cannot fairly be deemed pertinent to applicant's problem. More particularly, as explained in the accompanying Declaration of Inventor Abrar Jawaid, Akhtar et al.'s logs and even wood planks have a set of certain basic and fundamental properties, whereas board material

such as Michanickl's and the board material expressly required by applicant's claim 23 have a completely different and non-overlapping set of basic and fundamental properties:

> 5. Wood is a highly complex and ordered material at the chemical level, as well as the microscopic and visible levels. Plant cell walls that are present in unprocessed wood are made from millions of cellulose fibres (also known as microfibrils) in combination with other plant polysaccharides, such as hemi-cellulose and pectin, along with lignin. The individual cells in wood tissue are arranged in order to allow water to flow within the plant. To further promote the movement of water within the living tree, wood also comprises structures known as "pits". These are found in the individual plant cell walls and regulate the movement of water from one adjacent cell to the next, and thus throughout the wood tissue as a whole. Pits are also complex structures which can open and close in response to physiological stimuli in a living plant. ***Thus, wood comprises a network of natural channels and passages which are linked together by pits.***
>
> 10. ... At the chemical level, wood is a complex material comprising fibres of cellulose and other polysaccharides crosslinked by lignin. ....
>
> 9. ***The term "board material" is a term of the art and in this context would be understood to refer specifically to a processed, composite material.*** In other words, a composite which has been derived from smaller chips, fragments, fibres and/or particles of wood which have been bonded together artificially using, for example a man-made glue (such as, for example, a polyurethane, urea formaldehyde, melamine-urea, isocyanate or phenolic resin). This definition is in accordance with the discussion in paragraph 2 of the present application. ....
>
> 11. ... The wood-derived components present in a man-made composite board material are bound together, not by lignin, but by a man-made adhesive, such as a resin, that is added during the manufacture of the board. Typically, the wood fibres etc. are linked together by the curing of resin droplets, which would ideally be distributed throughout the wood fibres etc. as evenly as possible. The droplets of resin link the fibres together and form a bond when hot pressed. Individual wood fibres etc. overlay each other in a random manner and where a droplet of resin exists a

bond is formed. ***In contrast to unprocessed wood, board materials are thus highly homogenous and do not retain the internal structure and complexity that characterises unprocessed wood.***

Here is an example of wood cell structure:

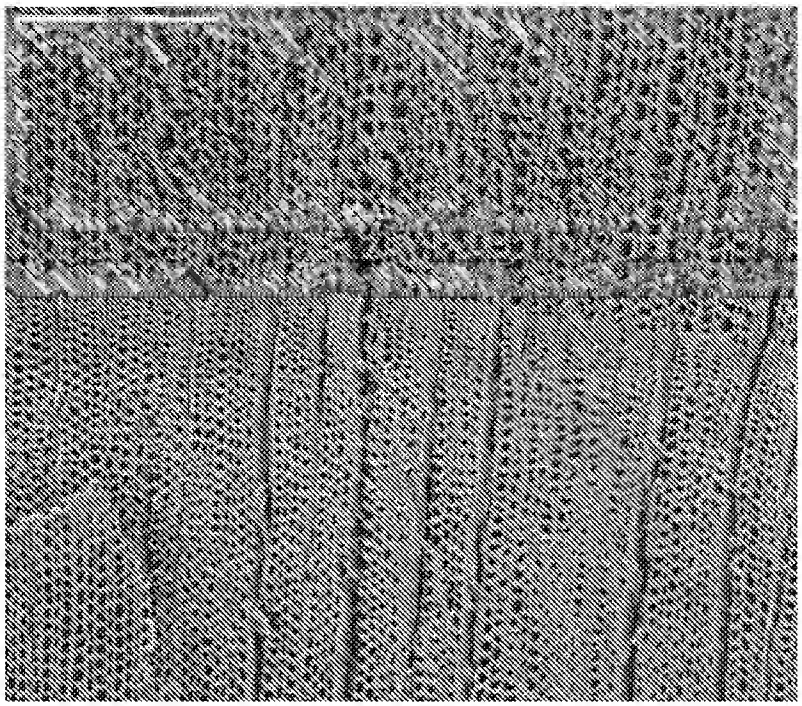


Image of boundary of early and late wood cell walls

Fiberboard and other "board material" such as wood chips held together by man-made adhesive obviously does not have this structure. The starting material logs and wood planks are therefore obviously fundamentally different from recycled composite board material. And obviously applicant's recovered lignocellulosic elements are different from Akhtar et al.'s recovered cellulosic elements largely separated from lignin contaminant. Applicant therefore respectfully requests that the rejection be withdrawn because the Akhtar et al. reference is neither in applicant's field of endeavor nor reasonably pertinent to applicant's problem of recovering lignocellulosic elements from recycled board material.

The assertion on page 4 of the Office action that both Michanickl et al. and Akhtar et al. are related to the subject matter of "separating bonded lignocellulosic materials" is misleading and, at best, imprecise. Akhtar et al. separate lignocellulosic material (natural wood) into 1) lignin (and lignin degradation products), and 2) cellulosic fibers with low-lignin contamination. Michanickl et al. separate lignocellulosic material out of discarded furniture and the like, but do not separate lignocellulosic material into 1) lignin and 2) cellulosic fibers with low-lignin contamination.

ii) Akhtar et al.'s Starting Material Precludes Obviousness

For the present rejection based on obviousness to be maintained, there must be a valid *reason* for one skilled in the art to incorporate any operation from Akhtar et al. into Michanickl et al.'s process, as stated in MPEP §2142:

> The key to supporting any rejection under 35 U.S.C. 103 is the clear articulation of the reason(s) why the claimed invention would have been obvious. The Supreme Court in *KSR International Co. v. Teleflex Inc.*, 550 U.S. ___, ___, 82 USPQ2d 1385, 1396 (2007) noted that the analysis supporting a rejection under 35 U.S.C. 103 should be made explicit. The Federal Circuit has stated that "rejections on obviousness cannot be sustained with mere conclusory statements; instead, there must be some ***articulated reasoning with some rational underpinning*** to support the legal conclusion of obviousness." *In re Kahn*, 441 F.3d 977, 988, 78 USPQ2d 1329, 1336 (Fed. Cir. 2006). See also *KSR*, 550 U.S. at ___ , 82 USPQ2d at 1396 (quoting Federal Circuit statement with approval). (emphasis added)

In the present situation, the respective starting materials are so fundamentally different that one skilled in the art would have no reason to apply to recycled board material what Akhtar et al. does to natural wood. As noted above and in the accompanying Declaration, for example:

> 5. Wood is a highly complex and ordered material at the chemical level, as well as the microscopic and visible levels. Plant cell walls that are present in unprocessed wood are made from millions of cellulose fibres (also known as microfibrils) in combination with other plant polysaccharides, such as hemi-cellulose and pectin, along with lignin. The individual cells in wood tissue are arranged in order to allow water to flow within the

> plant. To further promote the movement of water within the living tree, wood also comprises structures known as "pits". These are found in the individual plant cell walls and regulate the movement of water from one adjacent cell to the next, and thus throughout the wood tissue as a whole. Pits are also complex structures which can open and close in response to physiological stimuli in a living plant. Thus, wood comprises a network of natural channels and passages which are linked together by pits.
>
> 10. ... At the chemical level, wood is a complex material comprising fibres of cellulose and other polysaccharides crosslinked by lignin. ....
>
> 9. The term "board material" is a term of the art and in this context would be understood to refer specifically to a processed, composite material. ...
>
> 11. ... The wood-derived components present in a man-made composite board material are bound together, not by lignin, but by a man-made adhesive, such as a resin, that is added during the manufacture of the board. Typically, the wood fibres etc. are linked together by the curing of resin droplets, which would ideally be distributed throughout the wood fibres etc. as evenly as possible. The droplets of resin link the fibres together and form a bond when hot pressed. Individual wood fibres etc. overlay each other in a random manner and where a droplet of resin exists a bond is formed. In contrast to unprocessed wood, board materials are thus highly homogenous and do not retain the internal structure and complexity that characterises unprocessed wood.

Of course one skilled in the art would understand that the Akhtar et al. reference relates to natural wood which has an internal network of natural channels and passages. And this person would understand that a composite board material is chips or the like in a matrix of man-made adhesive, and therefore does not have this internal network of natural channels and passages. Such network and passages would be disrupted by board material's cured adhesive and the physical disarrangement arising from the manufacture of composite board material from chips or other fragments of wood etc. So this person would have no reason to think that an operation which Akhtar et al. found

to be successful on a material with, and dependent on, a network of natural channels and passages, would be successful on a material lacking this network, or otherwise would be worthwhile in Michanickl et al.'s scheme (see Inventor's Declaration):

> 13. As noted by the Examiner, at paragraph 38, Akhtar describes how steam pressure generated inside the wood, under the influence of microwave treatment, can destroy pit membranes and vessel cell walls, increasing porosity and permeability. The highly ordered and organized structure of unprocessed wood itself would be expected to enhance this process. For example, steam pressure build up within the wood cells responsible for the conduction of water would be expected to be transmitted through the wood (in a manner analogous to the transportation of water during the life of the tree). Thus, the complex internal structure of the wood would be expected to help the steam penetrate into the wood and promote its disruption and breakdown. However, the homogeneity of a board material would not be expected to assist in this process. The lack of an intact network of vessels, interconnected by pits, would be expected to result in a lack of steam pressure build up and subsequent transmission into the material.

Accordingly, one skilled in the art would have no reason to apply Akhtar et al.'s microwave technique to Michanickl's or applicant's wholly distinct starting materials.

<u>iii) Akhtar et al.'s Function, Purpose, and Mechanism Preclude Obviousness</u>

The Akhtar et al. process employs microwave radiation to achieve a function which is different from the function achieved by the electromagnetic radiation required by applicant's claim 23. As noted on page 7 of the Office action and Akhtar et al.'s paragraph 0038, their process uses microwave radiation to destroy physical structures within the wood which otherwise would inhibit access of treatment chemicals to the wood:

> [0038] It has now been discovered that a pulping process that includes a pre-treatment or exposure of the pulp source to

> microwave radiation allows for increased porosity and permeability of the pulp source. Generally speaking, this improved pulping process is most applicable to wood, generally in the form of logs. *The increase in permeability after microwaving pretreatment is due, in part, to breakage of pit membranes and vessel cell ends caused by steam pressure generated inside the wood. Breakage of pit membranes and vessel cell walls by microwave exposure substantially increases access of process chemicals to wood.* During the microwaving process, some of the water in the wood is converted to steam. Major advantages of microwave over other conventional methods are increased pulp yield, high speed, low or no chemical use, low wood inventories, low waste production, and low process cost during papermaking. (emphasis added)

In sharp contrast, the desirable function accomplished by the electromagnetic radiation in the present invention is to disrupt and hydrolyze man-made chemical adhesives in composite board material which glue the lignocellulosic elements such as fibers together, as stated in applicant's specification:

> [0009] The invention has been based in part on our discovery that treatment of board materials comprised of an adhesively bonded matrix of lignocellulosic elements, for example particles or fibres, by exposure to electromagnetic energy in the frequency range of from 10 MHz to 2500 MHz and soaking with a liquid medium such as water produces substantial swelling of the board material, which, we believe, *mechanically disrupts and possibly at least partially hydrolyses the adhesive bonding the lignocellulosic elements together so that these elements can now be readily separated from each other*. The degree of swelling achieved is considerably more that that which is obtained simply by soaking the board material in the liquid medium. (emphasis added)

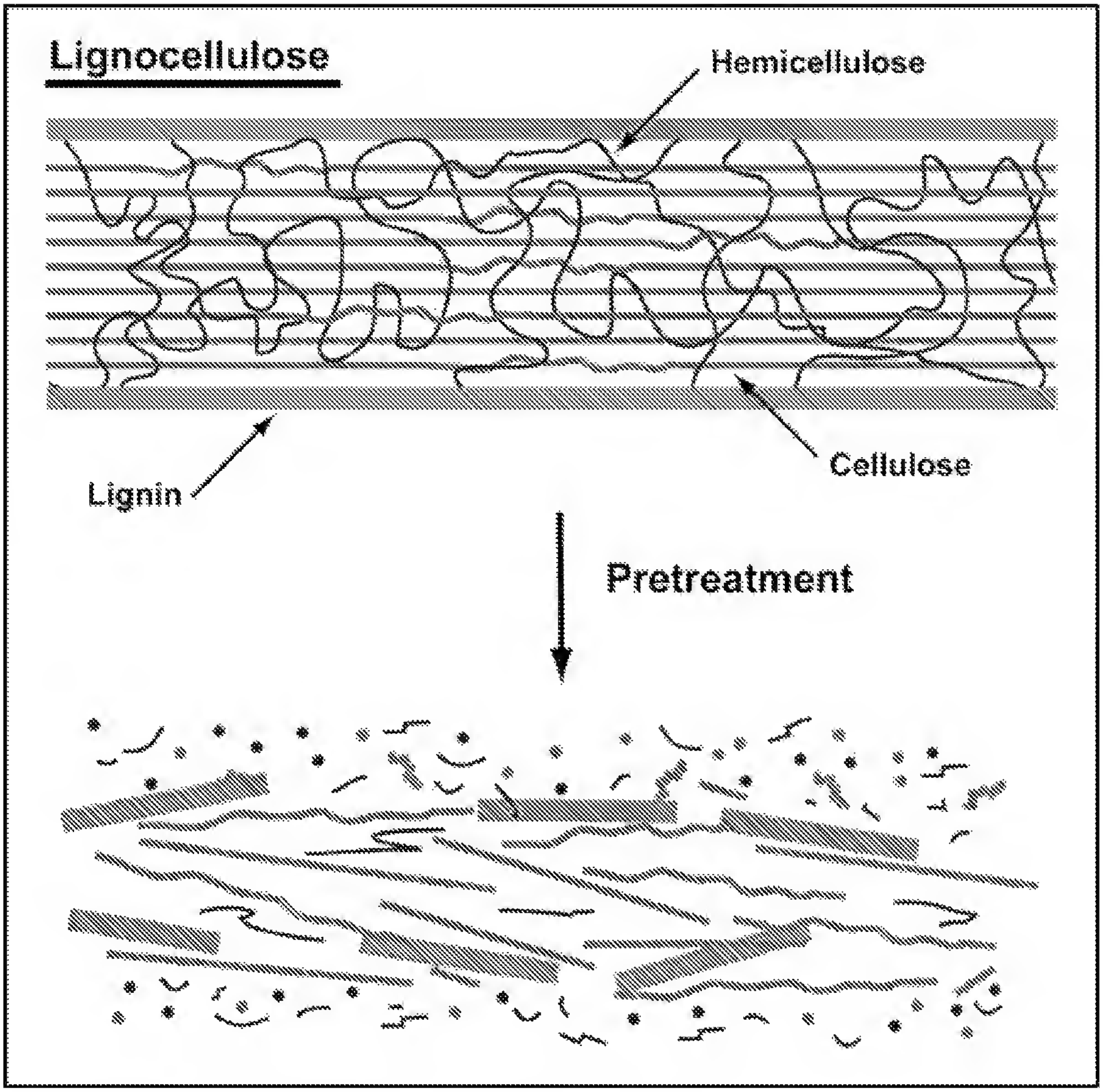
So Akhtar et al. use electromagnetic radiation to break membranes and walls; Michanikl et al. do not use such radiation; and applicant uses the radiation to destroy and hydrolyze chemical adhesive which bonds together fibers and the like.

The Akhtar et al. process employs microwave radiation to achieve the end purpose of reducing lignocellulosic fibers into their distinct elements of lignin and

cellulosic fibers so that then the cellulosic fibers (wood fibers) can be used in making paper and have a low level of contamination by lignin (emphasis added):

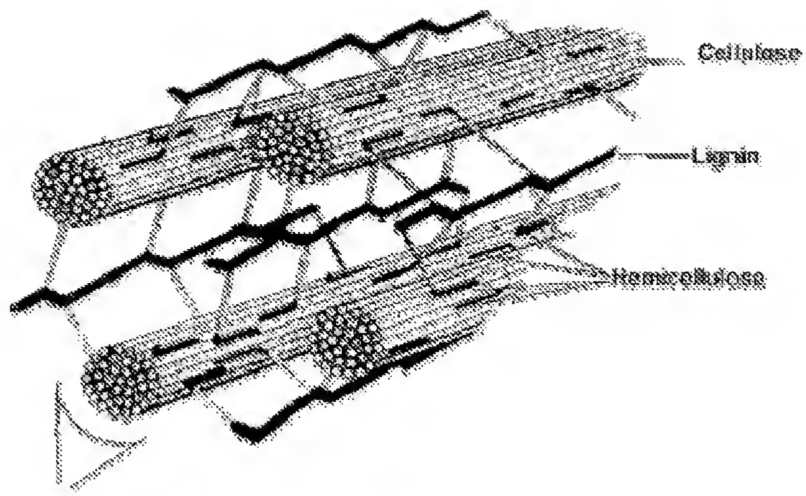
> [0002] In the manufacture of paper from wood, the wood is first reduced to an intermediate stage in which *the wood fibers are separated from their natural environment* and transformed into a viscous liquid suspension known as a pulp. There are several classes of techniques which are known, and in general commercial use, for the production of pulp from various types of wood.... *In all of these processes for creating pulps from wood, the concept is to separate the wood fibers to a desired level of freeness from the complex matrix in which they are embedded in the native wood.*
>
> [0003] Of the constituents of wood as it exists in its native state, cellulose polymers are the predominate molecule. Cellulose is desired for retention in the pulp for paper production. The second most abundant polymer in the native wood is lignin. Lignin, the least desirable component in the pulp, is a complex macromolecule of aromatic units with several different types of interunit linkages. In the native wood, lignin physically protects cellulose polysaccharides in complexes known as lignocellulosics that must be disrupted for there to be accessibility to the polysaccharides, (e.g., by enzymes) or *to separate lignin from the matrix of the wood fibers.*

An example of this process of breaking lignocellulosic material from wood into its distinct components is demonstrated here:



Lignocellulose model showing lignin, cellulose and hemicellulose
SOURCE: USDA Agricultural Research Service
http://www.biomassmagazine.com/article-print.jsp?article_id=1533

In sharp contrast, the desirable end purpose achieved in applicant's invention is to recover in-tact lignocellulosic elements such as shown in the following figure from discarded composite board material so that these elements can be recycled to make new products:



http://www.life.ku.dk/forskning/online_artikler/artikler/marken_en_stor_solfanger.aspx?lg=print

This is underscored in applicant's specification (emphasis added):

> [0001] The present invention relates to the recycling of lignocellulose based board (or panel) material comprised of a matrix of adhesively bonded lignocellulosic elements so as to permit *recovery of constituents of the board material, particularly but not exclusively of the lignocellulose.*
>
> [0002] It is well-known that various board materials comprise a matrix of lignocellulosic elements (e.g. in the form of chips, particles or fibres) bonded together by means of an adhesive such as, for example, a polyurethane, urea/formaldehyde, melamine-urea or phenolic resin. Examples of board materials produced in this way include MDF (Medium Density Fibreboard), particle board and chip board.
>
> [0003] Board materials of the type described above are used extensively for producing finished articles such as, for example, furniture. For this purpose, the board materials are entirely satisfactory. However there is a substantial amount of waste material for which disposal poses a problem. To illustrate the point, the UK furniture manufacturing industry generates over 170,000 tonnes of MDF waste every year. This does not include rejected and damaged furniture items. *Ideally the waste material would be recycled to recover constituents thereof, particularly the*

> *lignocellulose for reuse*. However, no satisfactory recycling process is currently available. The problem is made worse by the fact that the waste board material may be laminated to a surface layer such as, for example, paper foil or plastics (e.g. for decorative purposes) or may have, for example, plastic or metal inserts. As such, any recycling process will need to remove the laminates and/or inserts. In the absence of any suitable recycling process, most of the waste board material will be dumped in landfill site, which is becoming more difficult and very expensive.

So Akhtar et al. use electromagnetic radiation toward the end of getting wood fibers with a low level of lignin contamination out of native wood; Michanikl et al. do not use such radiation; and applicant uses the radiation toward the end of getting entire lignocellulosic elements -- not wood fibers substantially separated from their paper-contaminating lignin -- out of recycled, processed, man-made, composite board such as discarded furniture.

The mechanism by which the Akhtar et al. process works is specifically enabled by the internal structure of natural wood (see Inventor's Declaration):

> 13. As noted by the Examiner, at paragraph 38, Akhtar describes how steam pressure generated inside the wood, under the influence of microwave treatment, can destroy pit membranes and vessel cell walls, increasing porosity and permeability. The highly ordered and organized structure of unprocessed wood itself would be expected to enhance this process. For example, steam pressure build up within the wood cells responsible for the conduction of water would be expected to be transmitted through the wood (in a manner analogous to the transportation of water during the life of the tree). Thus, the complex internal structure of the wood would be expected to help the steam penetrate into the wood and promote its disruption and breakdown. However, the homogeneity of a board material would not be expected to assist in this process. The lack of an intact network of vessels, interconnected by pits, would be expected to result in a lack of steam pressure build up and subsequent transmission into the material.

In contrast, composite board material starting material lacks this internal structure; such that applicant's and Michanickl et al.'s starting materials are not conducive to Akhtar et al.'s mechanism of interaction between the material and

water excited by microwave radiation. Akhtar et al.'s mechanism relies on an open network and passages, but these would be disrupted by board material's cured adhesive and the physical disarrangement arising from the manufacture of composite board material from chips or other fragments of wood etc.

Applicant appreciates that in one sense it is irrelevant that Akhtar et al.'s function and purpose and mechanism are not the same as applicant's function and purpose and mechanism, because if it were obvious to use Akhtar et al.'s microwave radiation for any purpose, then it would have been obvious to use it, period. ***But in this instance, Akhtar et al.'s function and purpose and mechanism are precisely why it would NOT have been obvious to use Akhtar et al.'s microwave radiation in Michanickl et al.'s process.*** Their function of breaking cell walls and membranes is of course desirable for *their* purpose of getting low-lignin contaminated wood fibers out of native wood in the context of papermaking. But it is neither necessary, nor helpful, nor germane to recovery of high-lignin contaminated lignocellulosic elements from recycled board products. Accordingly, one skilled in the art reading the Akhtar et al. reference would have no *reason* to lift their microwave operation and inject it into the Michanickl et al. process as proposed by the Office (see accompanying Inventor's Declaration):

> 14. For the above reasons, a person of ordinary skill in the art would not regard the teaching of a prior art document directed to a method of pulping wood logs (such as Akhtar) to be relevant to a method for the recovery of lignocellulosic elements from a processed material such as a composite board material. Thus there would have been no case to combine Akhtar (which teaches that steam pressure in wood vessels will increase porosity and permeability) with Michanickl (which teaches impregnation of fibre material). This is in addition to the fact that Akhtar is directed to methods which aim to minimise the content of lignin in the final material, whereas the presently claimed method is intended to preserve the lignocellulosic elements from the source board material. Thus, not only is there no case to combine the documents, but also there would be no expectation that the combination would be advantageous.

Where, as here, there is no valid *reason* to incorporate any operation from Akhtar et al. into Michanickl et al.'s process, the obviousness rejection cannot be maintained.

Applicant therefore respectfully requests withdrawal of the rejection of claim 23 because Akhtar et al. is non-analogous art; and even if it were analogous art, one skilled in the art would have no reason to modify Michanickl et al.'s process with Akhtar et al.'s microwave radiation because the starting materials are so different, and because Akhtar et al.'s function, result, and mechanism are not germane to Michanickl's material or process.

Claims 24, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 41 and 42 include the same requirements as claim 23 and are therefore patentable for the above reasons and in view of the additional requirements stated therein.

B. Mickanickl et al. , Akhtar et al., and Bergstrom

Applicant respectfully requests reconsideration of the rejection of claims 25, 26, and 40 as being unpatentable under 35 U.S.C. §103(a) over Michanickl et al. in view of Akhtar et al., further in view of Bergstrom et al.

Applicant respectfully submits that these claims are allowable because they depend from allowable claims; and moreover because the Bergstrom et al. reference suffers from the same deficiencies as the Akhtar et al. reference. In particular, the Bergstrom reference relates to the explosive obliteration of a lignocellulosic material with the aim of producing cellulose fibers. The proposed method is essentially an improved "Masonite" process (column 2, lines 56 to 59). The title of this patent is PROCESS OF FREEING CELLULOSE FIBERS FROM CELLULOSIC MATERIAL BY IRRADIATION. See also, for example, column 1, lines 6 to 11 which describes the preparation of "cellulose pulp" as a "complicated process.... the objective and result of which is a freeing of the fibers from the natural lignocellulosic structure in which they are retained." Thus, references to "fibers" by Bergstrom et al. must be understood to mean cellulose fibers, which if they comprise lignin, comprise it only as an undesirable

contaminant. It is an objective of Bergstrom et al. to minimize the levels of contaminating lignin and maximize the purity of the cellulose pulp.

Evidence as to the objectives of Bergstrom is provided at column 2, lines 45 to 55. This describes a drawback of the Masonite process, i.e. that the resulting cellulose pulp is of only a low grade, lignin having been deposited on and coating the cellulose fibers. In contrast, Bergstrom et al.'s process purportedly overcomes these disadvantages by using such an intensity of irradiation that "the water is vaporized before the lignocellulosic material is heated appreciably, so that the lignin does not coat the fibres." see column 2, line 65 to column 3, line 1. This allows them to recover fibers substantially without a lignin coating thereon.

Bergstrom et al.'s starting materials are natural products including "bagasse, plant material, and especially wood" ... "beech ... oak ... ash ... spruce" (column 3) and no mention is made of heavily processed starting materials such as "board material" (applicant's claim 1); or "composite board material" (applicant's amended claim 1); or "particle board or fibre board" (claim 44); or "chips, particles, or fibres bonded together by means of adhesive selected from the group consisting of a polyurethane, a urea/formaldehyde, melanamine-urea, and phenolic resin" (claim 45). Because Bergstrom et al.'s starting material is so distinct from Michanickl et al.'s and applicant's starting materials, one skilled in the art would have no reason to apply Bergstrom et al.'s teaching as proposed. As with Akhtar et al.'s teaching, one skilled in the art would consider Bergstrom et al.'s function, result, and mechanism to be inapplicable.

In conclusion, therefore, Bergstrom et al. do not teach a method of separating lignocellulosic fibers from one another. Instead, according to the title of the invention, it teaches "a process of freeing cellulose fibers from lignocelluosic material." As such, there is no reason to incorporate Bergstrom et al.'s teachings into the Michanickl et al. process on the same bases there is no reason to incorporate Akhtar et al.'s teachings into the Michanickl et al. process.

<u>II. Miscellaneous</u>

The Office makes a point on page 3 of the Office action that it is error to assume that Akhtar et al.'s pulping process fully removes lignin. Applicant acknowledges that this is the case. The Akhtar et al. reference's non-analogous nature and general inapplicability rest in the fact that Akhtar et al. used a fundamentally different starting material, and teach a fundamentally inapplicable function and mechanism to achieve a fundamentally different result. Its non-analogous nature and general inapplicability do not rest on any conclusion whether or not the Akhtar et al. product contains residual lignin.

The Office states on page 4 that applicant had failed to explain why a person of ordinary skill in the art would not have expected Michanickl et al.'s material to have increased porosity and increased impregnation under Akhtar et al.'s microwave treatment. Applicant has now explained that above and in the accompanying Inventor's Declaration, e.g.:

> 4. The Examiner asserts that "applicant fails to argue why a person of ordinary skill in art would not expect the lignocellulosic fibre material of Michanickl to have increased porosity and therefore increase impregnation under the microwave treatment of Akhtar". ...
>
> 13. As noted by the Examiner, at paragraph 38, Akhtar describes how steam pressure generated inside the wood, under the influence of microwave treatment, can destroy pit membranes and vessel cell walls, increasing porosity and permeability. The highly ordered and organized structure of unprocessed wood itself would be expected to enhance this process. For example, steam pressure build up within the wood cells responsible for the conduction of water would be expected to be transmitted through the wood (in a manner analogous to the transportation of water during the life of the tree). Thus, the complex internal structure of the wood would be expected to help the steam penetrate into the wood and promote its disruption and breakdown. However, the homogeneity of a board material would not be expected to assist in this process. The lack of an intact network of vessels, interconnected by pits, would be expected to result in a lack of steam pressure build up and subsequent transmission into the material.

> 14. For the above reasons, a person of ordinary skill in the art would not regard the teaching of a prior art document directed to a method of pulping wood logs (such as Akhtar) to be relevant to a method for the recovery of lignocellulosic elements from a processed material such as a composite board material. Thus there would have been no case to combine Akhtar (which teaches that steam pressure in wood vessels will increase porosity and permeability) with Michanickl (which teaches impregnation of fibre material). This is in addition to the fact that Akhtar is directed to methods which aim to minimise the content of lignin in the final material, whereas the presently claimed method is intended to preserve the lignocellulosic elements from the source board material. Thus, not only is there no case to combine the documents, but also there would be no expectation that the combination would be advantageous.

With regard to the assertion on page 5 of the Office action that claim 23 reads on two-by-four board, applicant respectfully requests reconsideration. As explained in paragraphs 6 through 9 of the Inventor's Declaration, "board material" as used in claim 23 is a term of art that means composite material involving smaller chips, fragments, fibres, or particles in a matrix of man-made glue. Gullichsen's reference to lignin as the "glue" which holds wood together uses "glue" figuratively, not literally, because "glue" is in quotation marks. It is like saying love is the "glue" which holds a family together. Lignin in natural wood is not a literal glue in the same sense as a man-made adhesive. Logs and two-by-fours do not contain any "glue" in the literal sense. They contain no man-made adhesive. In any event, applicant has amended claim 23 to specify that the board material is *composite*. New claims 44 and 45 further underscore the relevant distinctions.

III. New Claims

New claim 44 is supported by the text in paragraph 0013 of the published application. New claim 45 is supported by the text in paragraph 0002. These claims are patentable for the same reasons as claim 23, and because they are specifically limited to various composite board materials which further underscore

the non-analogous nature of the Akhtar et al. reference, and the inapplicability of the Akhtar et al. teachings.

CONCLUSION

In view of the above, favorable reconsideration and allowance of all pending claims are respectfully requested.

Respectfully submitted,

/paul fleischut/

Paul Fleischut, Reg. No. 35,513
SENNIGER POWERS LLP
100 North Broadway, 17th Floor
St. Louis, Missouri 63102
(314) 231-5400

PIF/axj